The main goal of this scientific project is to measure polarization of gamma radiation emitted by cosmic gamma-ray bursts. Measurements will be performed by the POLAR satellite experiment. Although the studies of gamma-ray bursts are conducted over years interest and investment in these studies continues to increase. The reason for this may be the mysterious nature of the events. They are in fact extremely difficult objects in the registration. On the one hand, these are the most energetic phenomena with emission of electromagnetic radiation in the universe. Flash energy is comparable and often exceeding the energy of a supernova. Bursts are observed at a frequency of about 1-3 per day. On the other hand, they last a very short time between fractions of seconds to several hundred seconds and appear in random directions in the sky (isotropic). Currently, it is believed that there are at least two classes of GRBs: shorter than 2 seconds and longer than 2 seconds. Bursts of a long duration are dominated by lower-energy photons than short bursts. It seems that these classes differ in mechanism of explosion. Thus the cause of long gamma-ray bursts are probably the sudden explosions in connection with the last phase of development of stars, called hypernova, and short gamma-ray bursts are a collision of celestial bodies existing in tight binary systems such as two neutron stars. The material produced during these events is rapid accretion disk, and then a strong magnetic field is forming matter in the form of two streams moving in opposite directions with the relativistic speeds. From the results of the previous space missions such as BATSE, INTEGRAL, Swift, theoretical models are developed attempting to explain the mechanisms of bursts. These models are very complex and take a number of astronomical, astrophysical and physical processes. Using only observational methods previously used in the field of optical, radio, X-ray and gamma-ray we are not able to answer questions related to the nature of gamma-ray bursts. Perhaps adding a new component of which is the measurement of the polarization will prove to be a valuable source of knowledge about space occurring in astrophysical processes that generate GRB.

The POLAR detector is compact Compton polarimeter with a very large field of view (1/3 of the sky), built of 1600 scintillator rods (bars) designed to measure the polarization of gamma radiation ranging from 50 - 500 keV. Photons of this energy are absorbed by the atmosphere and do not reach the Earth's surface, so the experiment will be placed on the Chinese space station Tiang Gong 2.

POLAR detector is made up of 25 modules. Inside each of the 25 modules 64 scintillating bars are arranged to act as detectors to scattered gamma rays. At the end of the module the 64-anode photomultiplier is installed collecting the signals of each bar separately. In the energy range 50-500keV the dominant process for the registration of photons in the detector is due to Compton scattering, or photon-electron scattering. In measuring the polarization of gamma-ray burst first two distractions are important. The second relative to the first determines the direction highlighted. It is from these we can obtain information about the polarization source. The aim of the project is to analyze the problem and select the best method of determining the degree of polarization of photons measured in the POLAR experiment. The detector will be ready to put on a satellite station in 2016. The first POLAR observations are scheduled for the end of 2016.

Before sending an experiment into space the equipment was tested under different conditions, because after placing it in space we will have no possibility of change it, and secondly, during the elevation of equipment into space can be exposed to damage. The detector is subjected to detailed tests: thermal taking place in several cycles in order to verify his work at low and high temperatures; vibratory that simulates the difficult conditions during the elevation of him rocket into space; vacuum. For the POLAR detector it was important to check whether data collection system is working properly. For this purpose, the POLAR detector was exposed several times to a polarized beam of synchrotron at the European Synchrotron Radiation Facility in Grenoble. It is worth noting that the execution of precise measurement of the polarization level of GRB will verify the validity of the existing theoretical models.